

manufacturing tools, the modular optical inspection system being outside of a vacuum environment, the modular optical inspection system including

a plurality of modular inspection subsystems each configured to detect defects on a portion of a semiconductor wafer,

a mechanism for moving at least one of the semiconductor wafer and the plurality of modular inspection subsystems with respect to one another, and

a master processor configured to process data delivered from at least some of the modular inspection subsystems, wherein a first one of the plurality of modular inspection subsystems includes a local processor configured to process data collected by the first modular inspection subsystem; and

(c) a handling tool for moving the semiconductor wafers among the plurality of manufacturing tools and the inspection system.

6. (Four Times Amended) In an integrated circuit manufacturing system including a plurality of interrelated integrated circuit manufacturing tools capable of operating in parallel on a plurality of semiconductor wafers, a method of inspecting a semiconductor comprising:

transferring the semiconductor wafer from one of the plurality of manufacturing tools to a modular optical inspection system that is disposed above a window of a central wafer handling chamber that is connected to each of the plurality of interrelated integrated circuit manufacturing tools, the modular optical inspection system being outside of a vacuum environment, the modular optical inspection system including a plurality of modular inspection subsystems each configured to detect defects on a portion of the semiconductor wafer, wherein the plurality of manufacturing tools comprise a cluster tool; and

moving at least one of the semiconductor wafer and the plurality of modular inspection subsystems with respect to one another such that each of the modular inspection subsystems inspects, in a single pass across the semiconductor wafer, an associated region of the semiconductor wafer.

9. (Twice Amended) A modular optical inspection system for inspecting a surface, the inspection system comprising:

a plurality of modular inspection subsystems each configured to detect defects on a portion of the surface;

Cont'd  
E3

a mechanism for moving at least one of the surface and the plurality of modular inspection subsystems with respect to one another, wherein at least one of the plurality of modular inspection subsystems includes

- (i) a two-dimensional sensor configured to receive light from the surface; and
- (ii) a controller configured to control the relative speeds at which

data is read from the sensor and

the modular inspection subsystem and the surface are moved with respect to one another

such that the surface is imaged in a time-delay integration mode,

wherein all of the plurality of modular inspection subsystems include separate sensors and separate controllers, and wherein each controller causes one row of pixel data to be read from a respective two-dimensional sensor each time the at least one inspection subsystem moves by one pixel length with respect to the surface, and wherein each of the modular inspection subsystems has a field of view spanning a fraction of the width of the surface.

E4

17. (Four Times Amended) A modular optical inspection system for inspecting a surface, the inspection system comprising:

a plurality of modular inspection subsystems each configured to detect defects on a portion of the surface;

a mechanism for moving at least one of the surface and the plurality of modular inspection subsystems with respect to one another; and

a master processor configured to process data delivered from at least some of the modular inspection subsystems,

wherein a first one of the plurality of modular inspection subsystems includes a local processor configured to process data collected by the first modular inspection subsystem, also wherein the modular optical inspection system is disposed above a window of a central wafer handling chamber that is connected to each of a plurality of integrated circuit manufacturing tools, the modular optical inspection system being outside of a vacuum environment, the plurality of integrated circuit manufacturing tools being a cluster tool.

E5

43. (Once Amended) An apparatus for processing semiconductor wafers comprising:

a wafer handling module containing an internal cavity, the wafer handling module having a port;

a process tool connected to the wafer handling module through the port;

Cont'd  
E5

a process sensor located proximate to the port and proximate to a window of the wafer handling module wherein the process sensor is located outside of a vacuum environment that is contained within the internal cavity of the wafer handling module; and

a handling mechanism located within the wafer handling module configured to transport a semiconductor wafer between the wafer handling module and the process tool.

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E6

53. (Once Amended) An apparatus for processing semiconductor wafers comprising:

a wafer handling module containing an internal cavity, the wafer handling module having a plurality of ports;

a plurality of process tools, each of the process tools connected to the wafer handling module through a respective one of the ports;

an inspection tool configured to detect defects on a semiconductor wafer, the inspection tool located proximate to a first one of the plurality of ports;

a thickness measurement tool configured to measure the thickness of materials deposited onto the semiconductor wafer, the thickness measurement tool located proximate to a second one of the plurality of ports, wherein both the inspection tool and the thickness measurement tool are also located proximate to a window of the wafer handling module and are outside of a vacuum environment that is contained within the internal cavity of the wafer handling module; and

a handling mechanism located within the wafer handling module configured to transport the semiconductor wafer between the wafer handling module and each of the process tools.

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E7

56. (Once Amended) An apparatus for processing semiconductor wafers comprising:

a wafer handling module containing an internal cavity, the wafer handling module having a plurality of ports;

a plurality of process tools, each of the process tools connected to the wafer handling module through a respective one of the ports;

a detector configured to measure critical dimensions of integrated circuits upon a semiconductor wafer, the detector located proximate to a first one of the plurality of ports;

a thickness measurement tool configured to measure the thickness of materials deposited onto the semiconductor wafer, the thickness measurement tool located proximate to a second one

Control  
E7

of the plurality of ports, wherein both the detector and the thickness measurement tool are also located proximate to a window of the wafer handling module and are outside of a vacuum environment that is contained within the internal cavity of the wafer handling module; and a handling mechanism located within the wafer handling module configured to transport the semiconductor wafer between the wafer handling module and each of the process tools.

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